DVT PROPHYLAXIS IN SURGICAL PATIENTS

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- Risk factors
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- Ways of prophylaxes
- Types of surgery vs. guidelines
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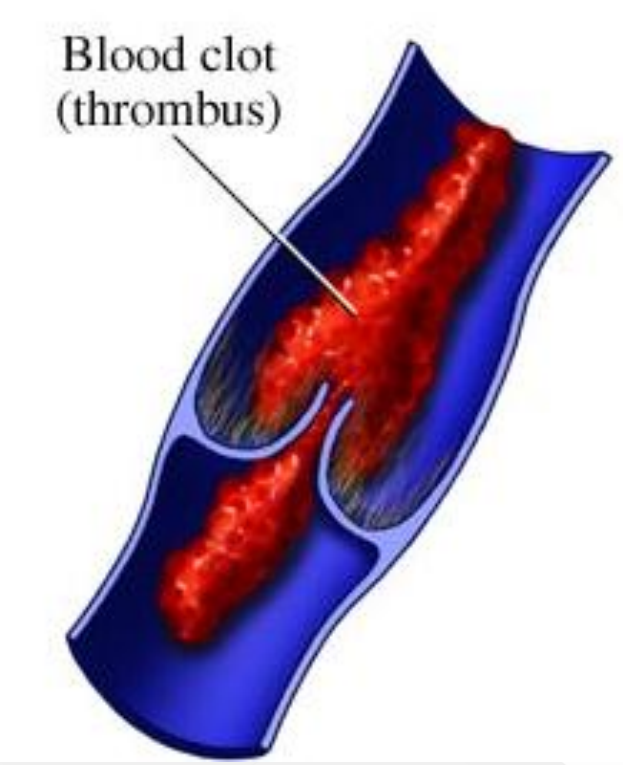
Overview

Venous thromboembolism (VTE)

- a condition in which a blood clot (thrombus) forms in a vein



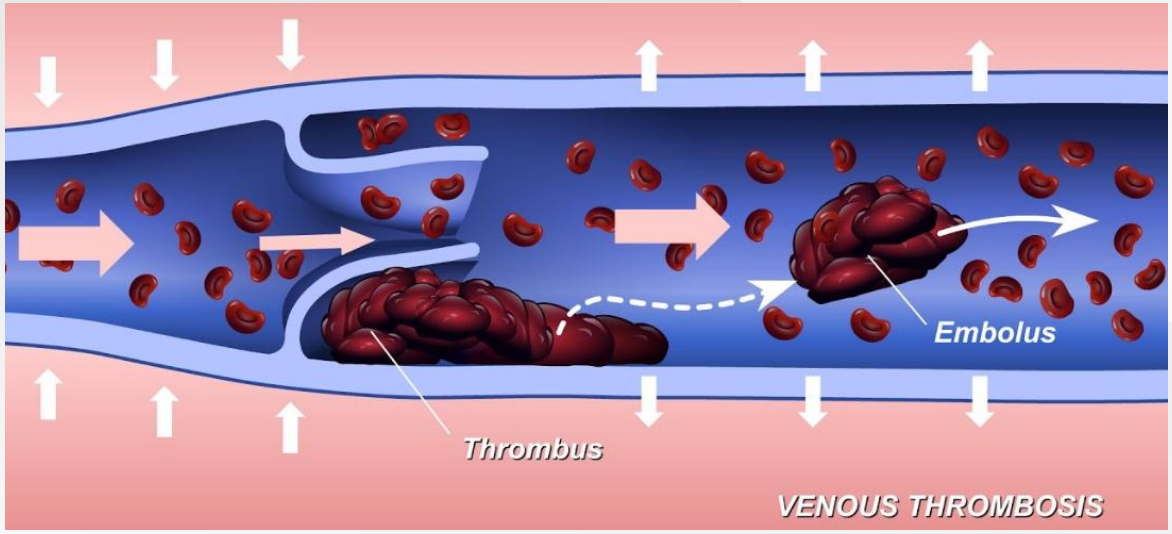
- most commonly occurs in the deep veins of the legs

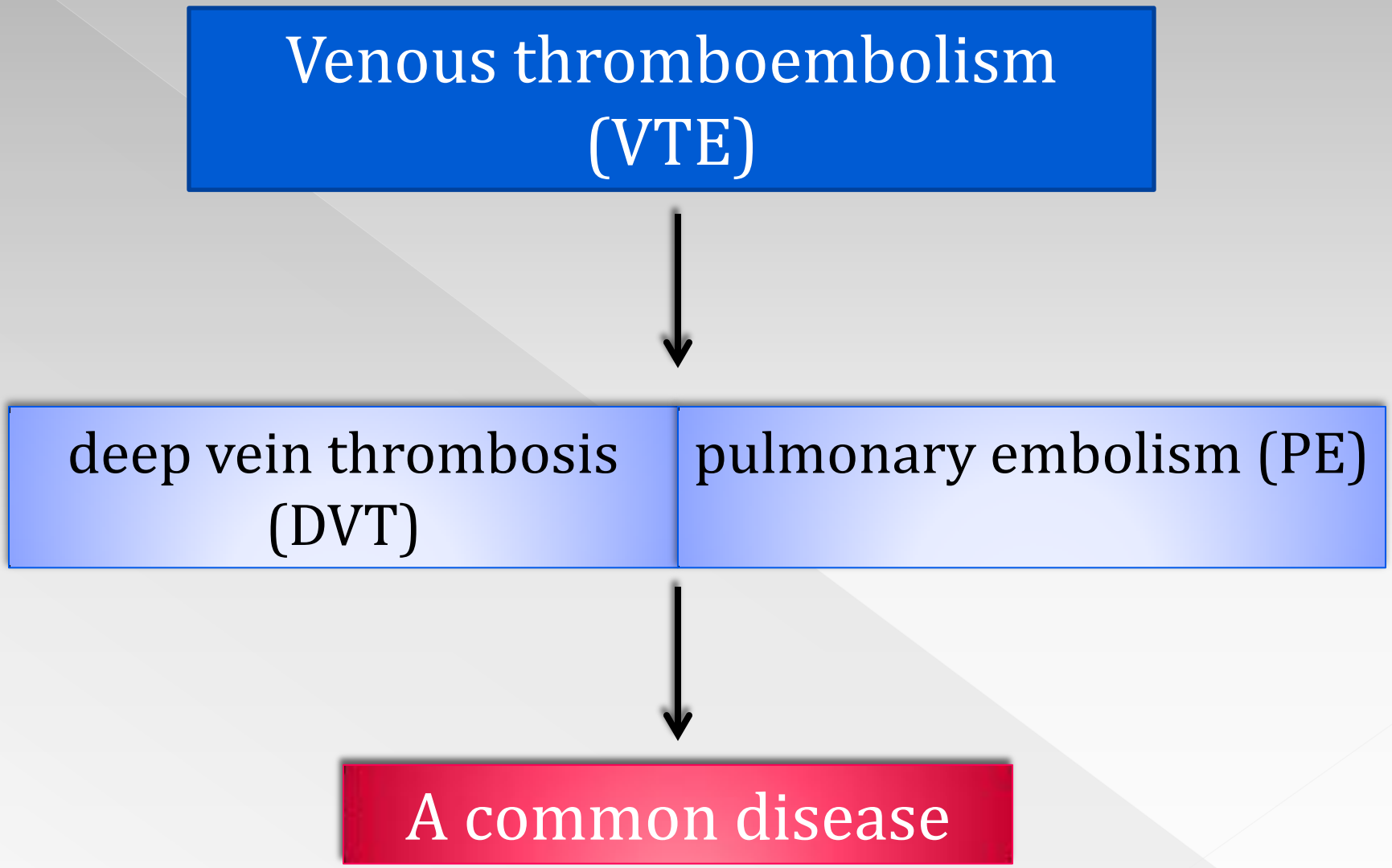
- **deep vein thrombosis (DVT)**

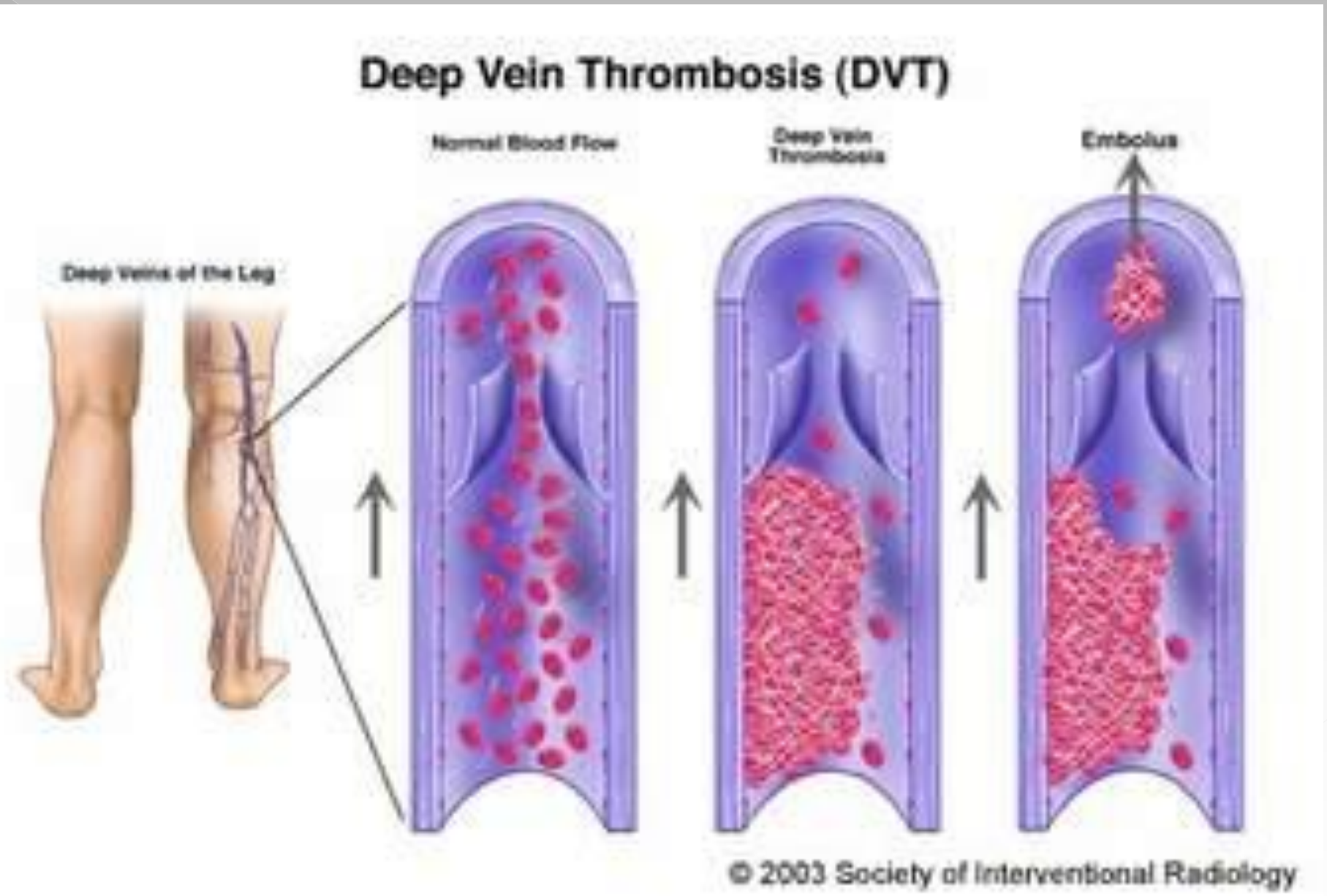
- Thrombus may dislodge from its site of origin to travel in the blood
- a phenomenon called embolism

Pulmonary embolism

- potentially fatal




Venous thromboembolism (VTE)
deep vein thrombosis (DVT)
pulmonary embolism (PE)
A common disease


Deep Vein Thrombosis (DVT)
Normal Blood Flow
Deep Vein Thrombosis
Embolus
Deep Veins of the Leg
© 2003 Society of Interventional Radiology

Symptomatic venous thrombosis

- A considerable burden of morbidity
  - long-term morbidity
  - because of chronic venous insufficiency

NICE clinical guideline 92 (2010)

- Patients who survive an acute thromboembolic event
  - 20% to 50% of symptomatic DVT patients - Post thrombotic syndrome
  - 4% of acute PE survivors develop chronic thromboembolic pulmonary hypertension

1.Kahn SR et al,2008 2. Pengo V et al, 2004

- Venous thrombosis is often asymptomatic (80% of DVT patients)
- high index of suspicion should be given to prevent unnecessary deaths
- Most hospitalized patients have at least one risk factor for VTE

Parakh et al, 2007

- the most common preventable cause of hospital death in surgical patients in the United States

- In a Japanese study, VTE occurred in 24.3% of patients that received abdominal surgery, including cases with symptomatic pulmonary embolism

Y. Masayoshi et al, A multicenter study in Japanese patients ,The American Journal of Surgery (2017), 213, 43-49.

- DVT
  - a major health problem in Western countries
  - 110 to 160 per 100,000 individuals in US and Europe respectively

- genetic predispositions may explain these high incidence in Caucasians

Cohen et al, 2007

- In Europeans
  - High factor V Leiden and Prothrombin gene mutation
- In Africans
  - High factor VIII, high von Willebrand Factor and low protein C

Zakai and McClure, 2011

Postoperative DVT
was believed to be rare in Asians

- Apparent rarity of postoperative DVT was supported by
  - rarity of factor V gene mutation
  - prothrombin gene mutation
- in Chinese and Asians

1.Tinckler, 1964 2. Zakai and McClure, 2011

- Reports from Hong Kong, Malaysia and India
  - high incidences of post operative DVT comparable to the Caucasians

- 15% in Japanese general surgical patients
- 19% of DVT in Chinese ICU patients
- 34.7% of in hospitalized patients in India

Sakon et al, 2010; Joynt et al,2009; Ray et al, 2010

- Clinicians in the East
  - to discuss about the rationale of Routine Prophylaxis against DVT

- Awareness on DVT in Myanmar – increasing

- DVT incidence in Mandalay – 21.6% in patients with any one of risk factors
  - Age over 45yr undergoing major surgery
  - Duration of operation over 90 minutes
  - Immobilization over 24 hr after operation
  - Co-existing malignancies
  - Use of contraceptive pill among female patients

Shein Myint, 2015

In Yangon General Hospital

- 71 symptomatic DVT patients in total 1338 cases undergoing major operations.

DVT

↓

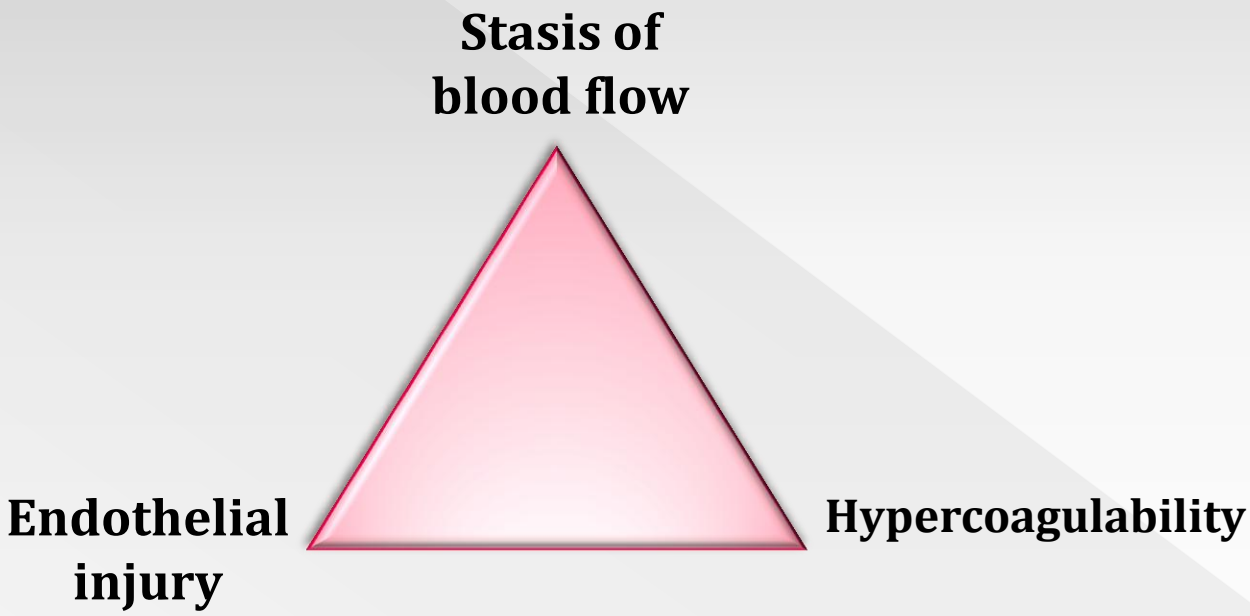
Attention of the surgeons

In New Yangon General Hospital

- 73 high risk patients (3.4 %) were detected out of 2119 total patients in a year duration (2016)
- DVT prophylaxis was done in 56 patients
- 3 patients developed symptomatic DVT (5.4%)
- 4 patients had wound bleeding

DVT Risk (Virchow triad)

- More than 100 years ago, **Rudolf Virchow** described a triad of factors of -



Risk Factors

Stasis	Hypercoagulability	Endothelial Damage
Age > 40	Cancer	Surgery
Immobility	High estrogen states	Prior VTE
CHF	Inflammatory Bowel	Central lines
Stroke	Nephrotic Syndrome	Trauma
Paralysis	Sepsis	
Spinal Cord injury	Smoking	
Hyperviscosity	Pregnancy	
Polycythemia	Thrombophilia	
Severe COPD		
Anesthesia		
Obesity		
Varicose Veins		

Anderson FA Jr. & Wheeler HB. *Clin Chest Med* 1995;16:235.

Risk stratification

Low risk [10% chance of DVT]

- Age < 40, no additional risk
- Elective, uncomplicated major abdominal/ thoracic surgery < 1 hour

Moderate risk [10 – 40% DVT]

- Age > 40, malignancy, obesity, paralysis, varicose vein
- General anaesthesia > 1 hour
- Prolong, bed rest > 3 days

High risk [40 – 80% DVT]

- H/o DVT, PE
- Extensive abdominal/ pelvic surgery (especially for advanced malignancy)
- Pelvic/ lower limb (ortho) surgery
- Most of ICU patient

Capirini Risk score model

Deep Vein Thrombosis (DVT) Prophylaxis Orders

(For use in Elective General Surgery Patients)

BIRTHDATE

NAME

CPI No.

SEX M F VISIT No.

Thrombosis Risk Factor Assessment (Choose all that apply)

Each Risk Factor Represents 1 Point

- ❑ Age 41-60 years
- ❑ Swollen legs (current)
- ❑ Varicose veins
- ❑ Obesity (BMI >25)
- ❑ Minor surgery planned
- ❑ Sepsis (<1 month)
- ❑ Serious Lung disease including pneumonia (<1 month)
- ❑ Oral contraceptives or hormone replacement therapy
- ❑ Pregnancy or postpartum (<1 month)
- ❑ History of unexplained stillborn infant, recurrent spontaneous abortion (≥ 3), premature birth with toxemia or growth-restricted infant
- ❑ Other risk factors_____
- ❑ Acute myocardial infarction
- ❑ Congestive heart failure (<1 month)
- ❑ Medical patient currently at bed rest
- ❑ History of inflammatory bowel disease
- ❑ History of prior major surgery (<1 month)
- ❑ Abnormal pulmonary function (COPD)

Subtotal:

Each Risk Factor Represents 2 Points

- ❑ Age 61-74 years
- ❑ Arthroscopic surgery
- ❑ Malignancy (present or previous)
- ❑ Laparoscopic surgery (>45 minutes)
- ❑ Patient confined to bed (>72 hours)
- ❑ Immobilizing plaster cast (<1 month)
- ❑ Central venous access
- ❑ Major surgery (>45 minutes)

Subtotal:

Each Risk Factor Represents 3 Points

- ❑ Age 75 years or older
- ❑ History of DVT/PE
- ❑ Positive Factor V Leiden
- ❑ Elevated serum homocysteine
- ❑ Heparin-induced thrombocytopenia (HIT) (Do not use heparin or any low molecular weight heparin)
- ❑ Elevated anticardiolipin antibodies
- ❑ Other congenital or acquired thrombophilia If yes: Type_____
- ❑ Family History of thrombosis*
- ❑ Positive Prothrombin 20210A
- ❑ Positive Lupus anticoagulant

Subtotal:

Each Risk Factor Represents 5 Points

- ❑ Stroke (<1 month)
- ❑ Elective major lower extremity arthroplasty
- ❑ Hip, pelvis or leg fracture (<1 month)
- ❑ Acute spinal cord injury (paralysis) (<1 month)
- ❑ Multiple trauma (<1 month)

Subtotal:

*** most frequently missed risk factor**

TOTAL RISK FACTOR SCORE:

FACTORS ASSOCIATED WITH INCREASED BLEEDING

Patient may not be a candidate for anticoagulant therapy & SCDs should be considered.

Active Bleed, Ingestion of Oral Anticoagulants, Administration of glycoprotein IIb/IIIa inhibitors, History of heparin induced thrombocytopenia

CLINICAL CONSIDERATIONS FOR THE USE OF SEQUENTIAL COMPRESSION DEVICES (SCD)

Patient may not be a candidate for SCDs & alternative prophylactic measures should be considered.

Patients with Severe Peripheral Arterial Disease, CHF, Acute Superficial DVT

Total Risk Factor Score	Risk Level	Prophylaxis Regimen
0	VERY LOW	❑ Early ambulation
1-2	LOW	❑ Sequential Compression Device (SCD)
3-4	MODERATE	Choose ONE of the following medications +/- compression devices: ❑ Sequential Compression Device (SCD) - Optional ❑ Heparin 5000 units SQ TID ❑ Enoxaparin/Lovenox: ❑ 40mg SQ daily (WT < 150kg, CrCl > 30mL/min) ❑ 30mg SQ daily (WT < 150kg, CrCl = 10-29mL/min) ❑ 30mg SQ BID (WT > 150kg, CrCl > 30mL/min) (Please refer to Dosing Guidelines on the back of this form)
5 or more	HIGH	Choose ONE of the following medications PLUS compression devices: ❑ Sequential Compression Device (SCD) ❑ Heparin 5000 units SQ TID (Preferred with Epidurals) ❑ Enoxaparin/Lovenox (Preferred): ❑ 40mg SQ daily (WT < 150kg, CrCl > 30mL/min) ❑ 30mg SQ daily (WT < 150kg, CrCl = 10-29mL/min) ❑ 30mg SQ BID (WT > 150kg, CrCl > 30mL/min) (Please refer to Dosing Guidelines on the back of this form)

❑ Ambulatory Surgery - No orders for venous thromboembolic prophylaxis required

❑ VTE Prophylaxis Contraindicated, Reason: _____

Joseph A. Caprini, MD, MS, FACS, RVT
VTE Risk Factor Assessment Tool

Physician Signature	Dr. #	Date	Time
Processed By:		Date/Time:	
	White-Medical Record Yellow-MIS Pink-Pharmacy	University of Michigan Health System	DVT Prophylaxis Regimen

UMHS ENOXAPARIN DOSING GUIDELINES

- MUST wait 24 hours before starting Enoxaparin if patient has epidural catheter
- D/C Enoxaparin 10-12 hours prior to removing epidural catheter
- May restart Enoxaparin 24 hours after epidural catheter has been removed.

NON-PREGNANT PATIENTS

Body weight < 150kg, CrCl > 30mL/min: **Enoxaparin 40mg SQ daily**
Body weight < 150kg, CrCl = 10-29mL/min: **Enoxaparin 30mg SQ daily**
Body weight > 150kg, CrCl > 30mL/min: **Enoxaparin 30mg SQ BID**

PREGNANT PATIENTS

Prevention of DVT:#
Maternal body weight (start of therapy) < 75 kg:
Recommend 30 mg SQ once daily until 20 weeks
Recommend 30 mg SQ BID after 20 weeks
Maternal body weight (start of therapy) ≥ 75 kg:
Recommend 40 mg SQ once daily until 20 weeks
Recommend 40 mg SQ BID after 20 weeks
#Wait 12 hours before regional anesthesia

MONITORING RECOMMENDATIONS

- Patients who are obese (actual body weight > 150 kg)
- Patients who are pregnant
- Patients with renal insufficiency (creatinine clearance < 30 ml/min)

Indication	Desired Level (Draw 4 hours after the 4th dose)	Recommendations for Dose Alteration		
		Anti-factor Xa Level (units/ml)	Dose Adjustment	Repeat Anti-factor Xa To Be Obtained
Prevention of DVT/PE	0.2 to 0.5 units/ml	< 0.2	Increase by 25 %	4 hours after 4th dose
		0.2 to 0.5	No change	Repeat in 1 week, then monthly thereafter
		0.6 to 1	Decrease by 20 %	4 hours after 4th dose
		> 1	Hold for 3 hours, then decrease next dose by 30%	4 hours after 4th dose

Ideal Body Weight
IBW, men = 50 kg + 2.3 (inches > 5 feet)
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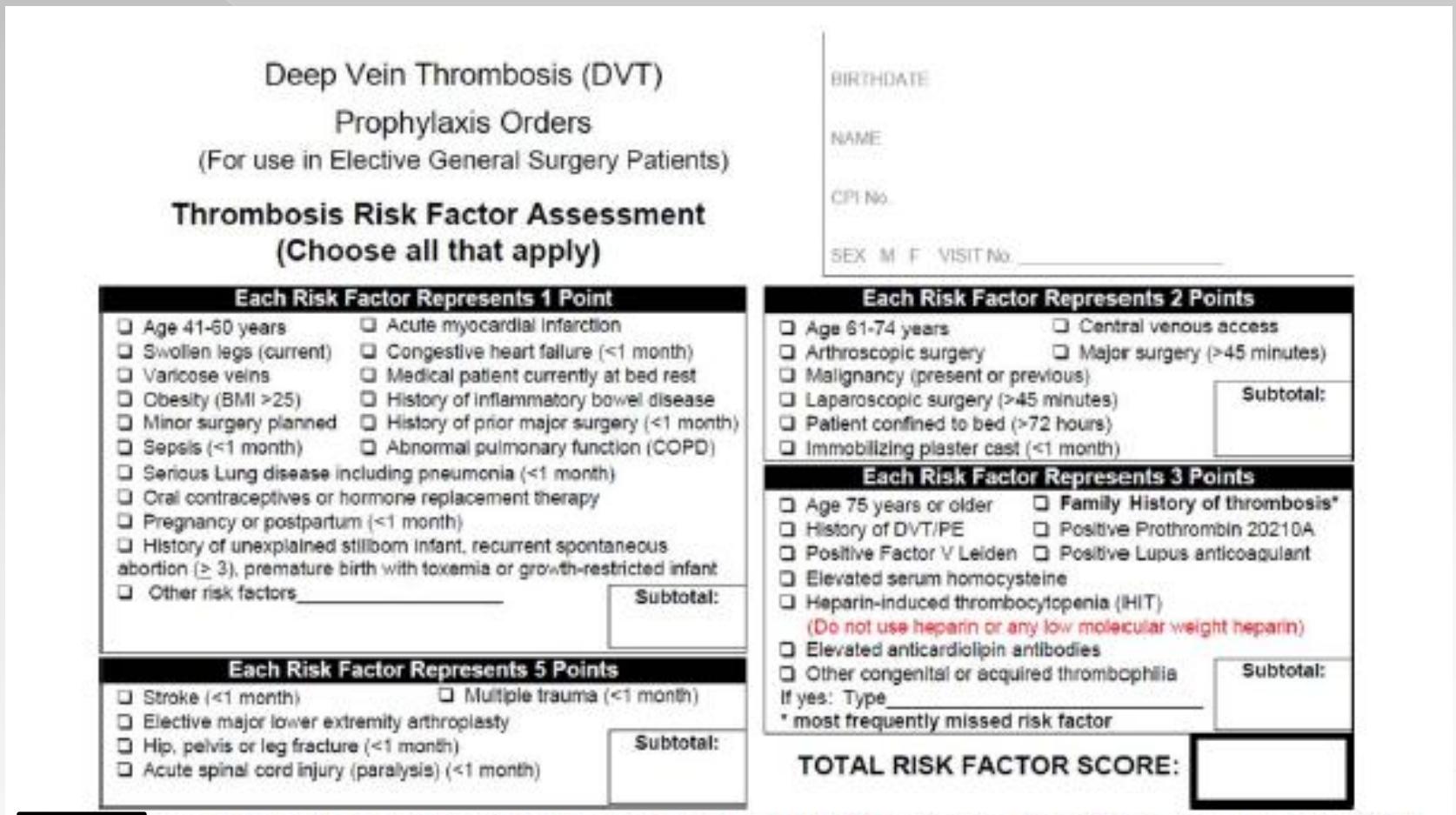
Capirini Risk score model



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- ❑ History of unexplained stillborn infant, recurrent spontaneous abortion (≥ 3), premature birth with toxemia or growth-restricted infant
- ❑ Other risk factors_____

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If yes: Type_____

* most frequently missed risk factor

- ❑ Family History of thrombosis*
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Subtotal:

TOTAL RISK FACTOR SCORE:

[redacted] Caprini risk scoring model.[40] *Earlier versions of this tool have been published in 2005[35] and 2009.[39] BMI = body mass index; COPD = chronic obstructive pulmonary disease; SVT = superficial venous thrombosis. Reproduced with permission from *Annals of Surgery*.

Each risk factor represent **1 Point.**

- **Age 41-60 years**
- **Swollen leg (current)**
- **Varicose veins**
- **Obesity (BMI >25)**
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Subtotal -

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- Patient confined to bed (> 72 hours)
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- Central venous access
- Major surgery (>45 minutes)

Subtotal -

Each risk factor represent **3 Points.**

- Stroke (< 1 month)
- Multiple trauma (< 1month)
- Elective major lower extrmity lower arthroplasty
- Hip, pelvic or leg fracture (<1month)
- Acute spinal cord injury (paralysis < 1 month)

Subtotal -

Each risk factor represent 5 Points.

- Age 75 years or older
- History of DVT or PE
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- Heparin induced thrombocytopenia (HIT)

*(Do not use any type of heparin)

- Elevated anticardiolipin antibodies
- Other congenital or acquired thrombophillia
  - If yes, type ------
  - Most frequently miss risk factor
- Family history of thrombosis
- Positive prothrombin 20210A
- Positive lupus anticoagulant

Subtotal -

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PREGNANT PATIENTS

Prevention of DVT:

Maternal body weight (start of therapy) < 75 kg:

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- **Recommend 30 mg SQ BID after 20 weeks**

Maternal body weight (start of therapy) > 75 kg:

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		0.6 to 1	Decrease by 20 %	4 hours after 4th dose
		> 1	Hold for 3 hours, then decrease next dose by 30%	4 hours after 4th dose

DVT Prophylaxis according to Caprini Score

Score 0 : very low risk

- no prophylaxis
- **ambulation**

Score 1-2 : low risk

- **mechanical prophylaxis** with IPC (intermittent pneumatic compression) perioperatively and during hospitalization

Score 3-4 : moderate risk

- LMWH(low molecular weight heparin),
- **UFH**(Unfractionated heparin),
- **Fxa I**(factor Xa inhabitor),
- **foot pumps or IPC** during hospitalization
- Start **AC** (Anticoagulants) 12-24 hours postoperatively

Score >5 : high risk

- **LMWH or UFH or FXa I plus elastic stockings or IPC** during hospitalization
- Start AC12 hours postoperatively and **7-10 days**

Score >8 : very high risk

- **AC+IPC** during hospitalization and **30 days**

All moderate and high risk patients should receive UFH, LMWH, FXa I unless contraindicated by bleeding risk

When to Start DVT Prophylaxis?

- The decision to initiate VTE prophylaxis should be based on
  - The patient's individual risk of thromboembolism and procedure
  - Risk of bleeding,
  - The balance of benefits versus harms.

Thrombosis risk factors

Procedural	Patient related
• Major orthopaedic surgery to lower limb, for example hip or knee replacement • Abdominal or pelvic surgery lasting more than 30 min under general anaesthetic • Major trauma, hip fracture is associated with a very high risk of deep vein thrombosis	• Age > 40 years and particularly >60 years • Obesity, BMI > 30 kg/m2 and particularly >35 kg/m2 • Previous DVT or PE • Known thrombophilia (a predisposing state which may be heritable) • Malignancy • Heart failure • Respiratory disease • Severe infection • Oestrogen therapy and high dose progestogens • Pregnancy and the postpartum • Immobility

Bleeding risk factors

Procedural	Patient related
• Neurosurgery • Eye surgery • Other procedures with a high bleeding risk	• Haemophilia and other bleeding disorders • Thrombocytopenia (platelets < 100 · 109/l) • Recent cerebral haemorrhage (in previous month) • Severe hypertension • Severe liver disease (prolonged PT or oesophageal varices) • Peptic ulcer • Endocarditis

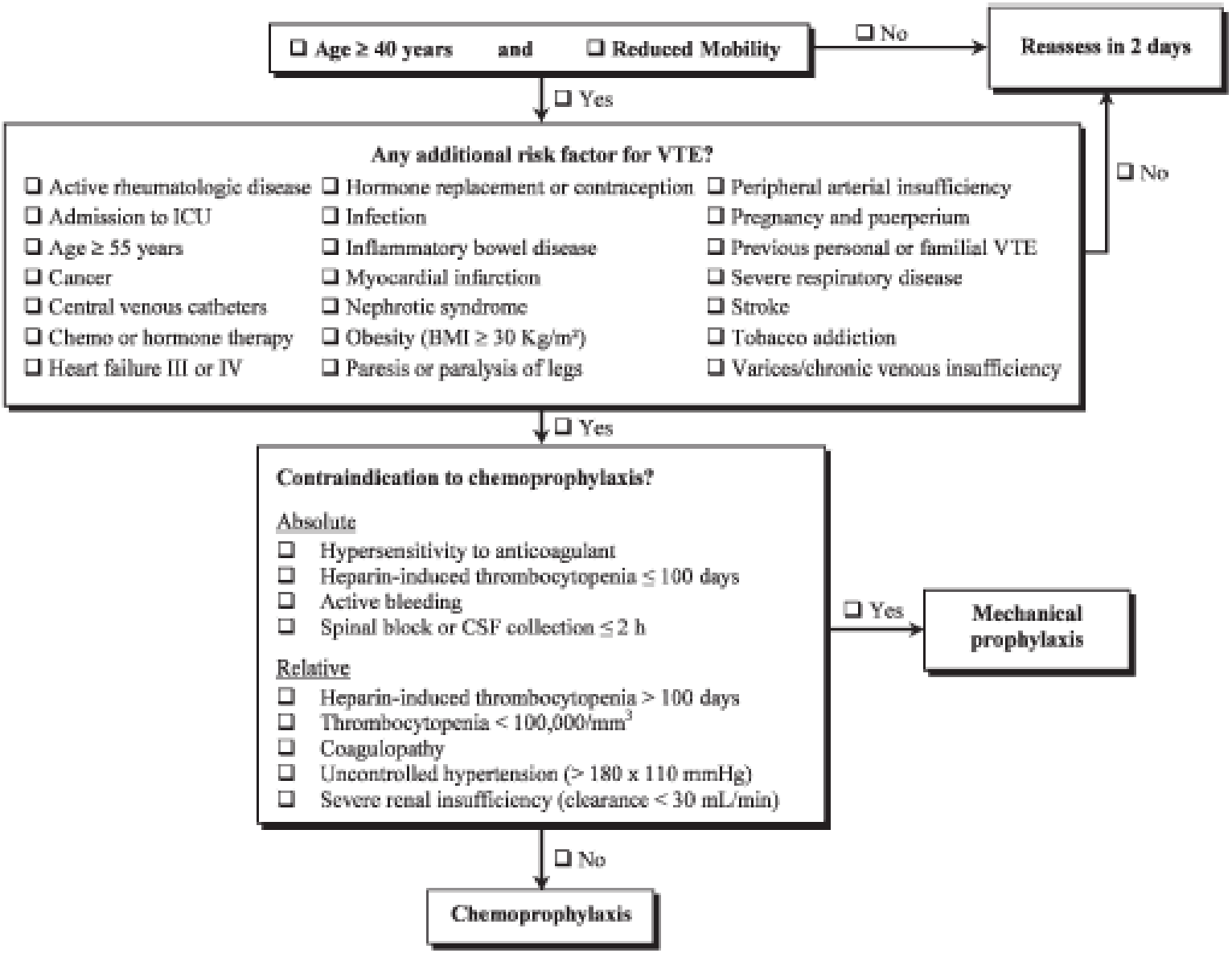


Figure 1 - Algorithm from the Brazilian Guidelines for VTE Prophylaxis in Hospitalised Patients.

Any additional risk factor for VTE?

- ❑ Active rheumatologic disease
- ❑ Admission to ICU
- ❑ Age ≥ 55 years
- ❑ Cancer
- ❑ Central venous catheters
- ❑ Chemo or hormone therapy
- ❑ Heart failure III or IV

- ❑ Hormone replacement or contraception
- ❑ Infection
- ❑ Inflammatory bowel disease
- ❑ Myocardial infarction
- ❑ Nephrotic syndrome
- ❑ Obesity (BMI ≥ 30 Kg/m^2)
- ❑ Paresis or paralysis of legs

- ❑ Peripheral arterial insufficiency
- ❑ Pregnancy and puerperium
- ❑ Previous personal or familial VTE
- ❑ Severe respiratory disease
- ❑ Stroke
- ❑ Tobacco addiction
- ❑ Varices/chronic venous insufficiency

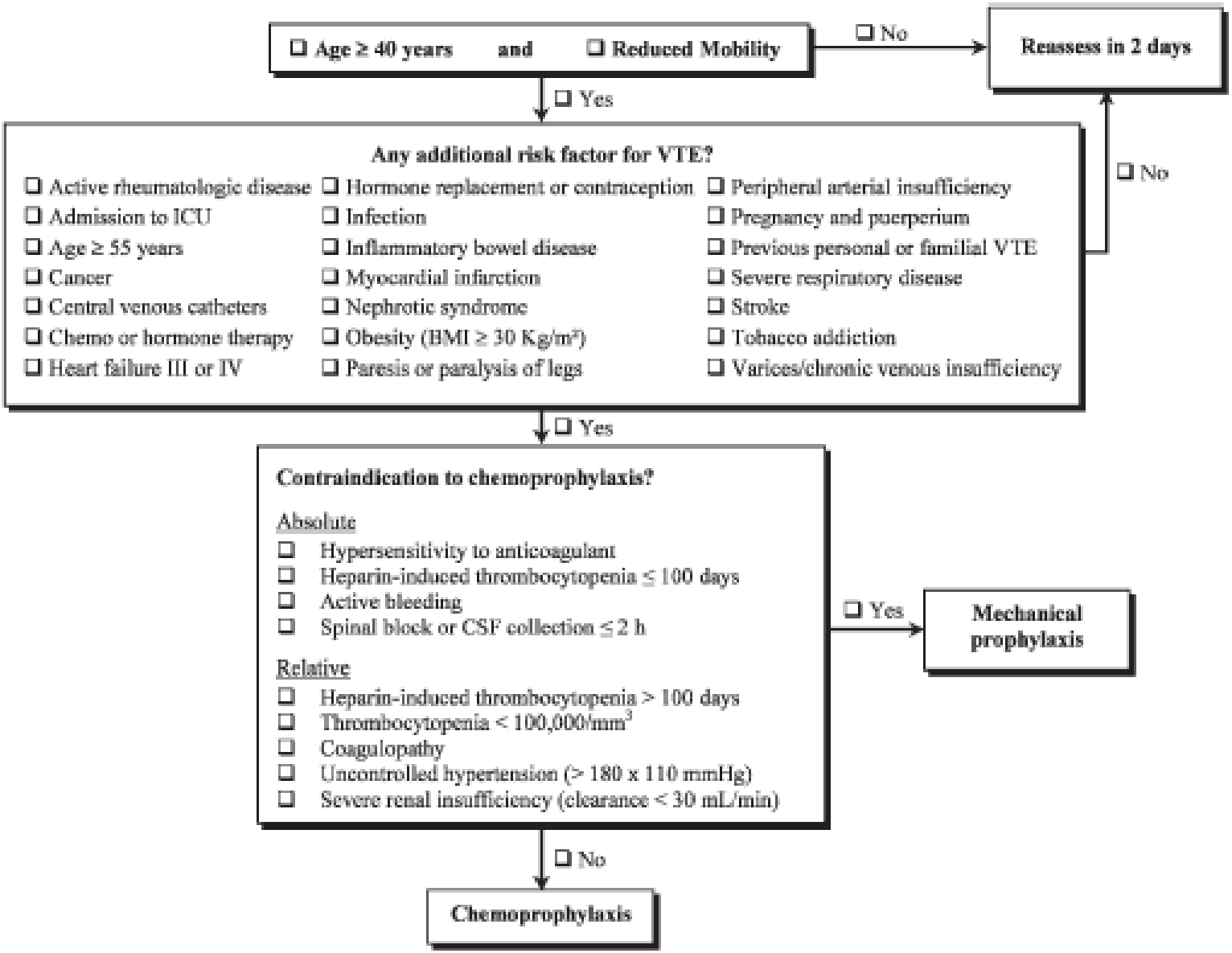


Figure 1 - Algorithm from the Brazilian Guidelines for VTE Prophylaxis in Hospitalised Patients.

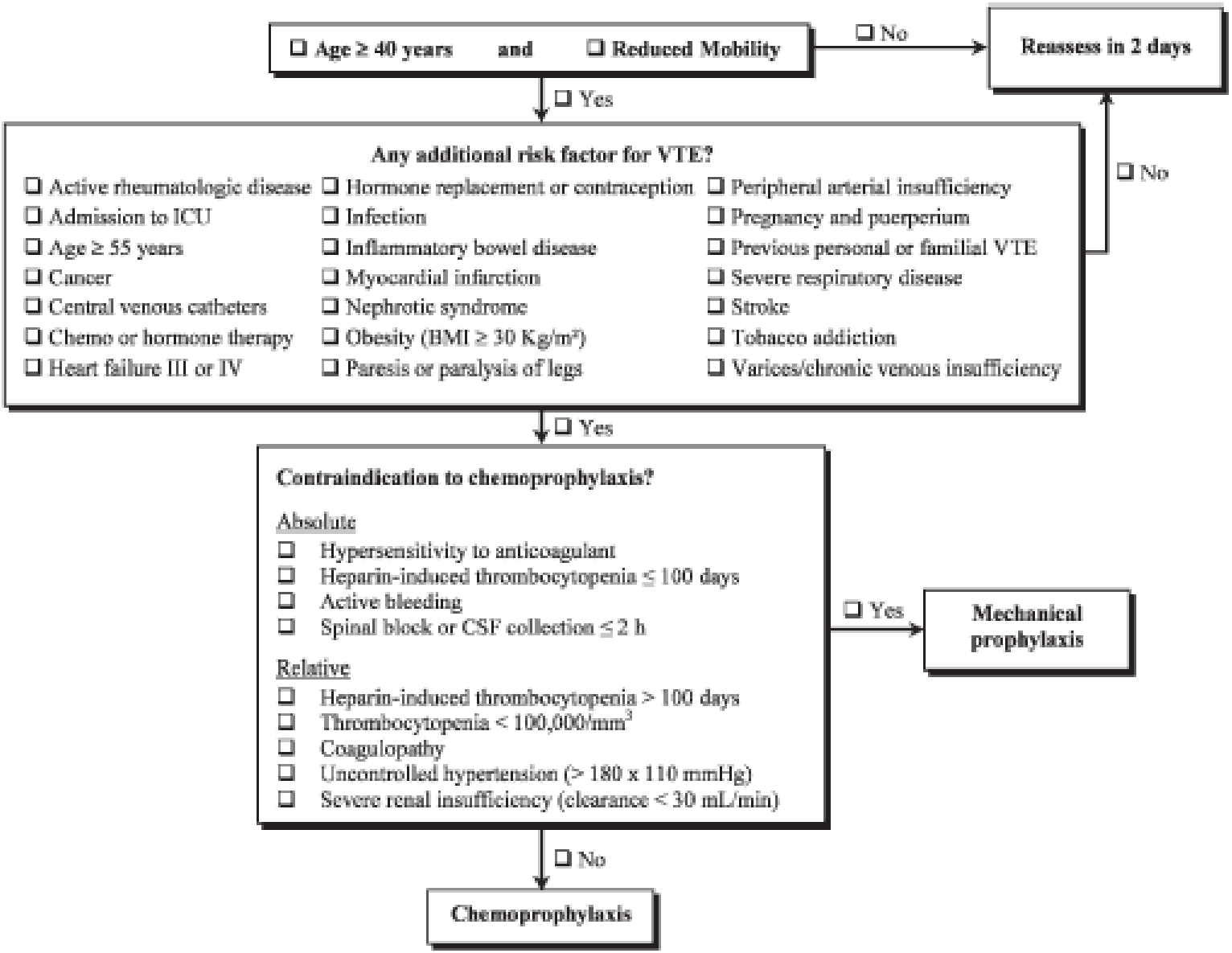
Contraindication to chemoprophylaxis?

Absolute

- ❑ Hypersensitivity to anticoagulant
- ❑ Heparin-induced thrombocytopenia ≤ 100 days
- ❑ Active bleeding
- ❑ Spinal block or CSF collection ≤ 2 h

Relative

- ❑ Heparin-induced thrombocytopenia > 100 days
- ❑ Thrombocytopenia < 100,000/mm^3
- ❑ Coagulopathy
- ❑ Uncontrolled hypertension (> 180 x 110 mmHg)
- ❑ Severe renal insufficiency (clearance < 30 mL/min)



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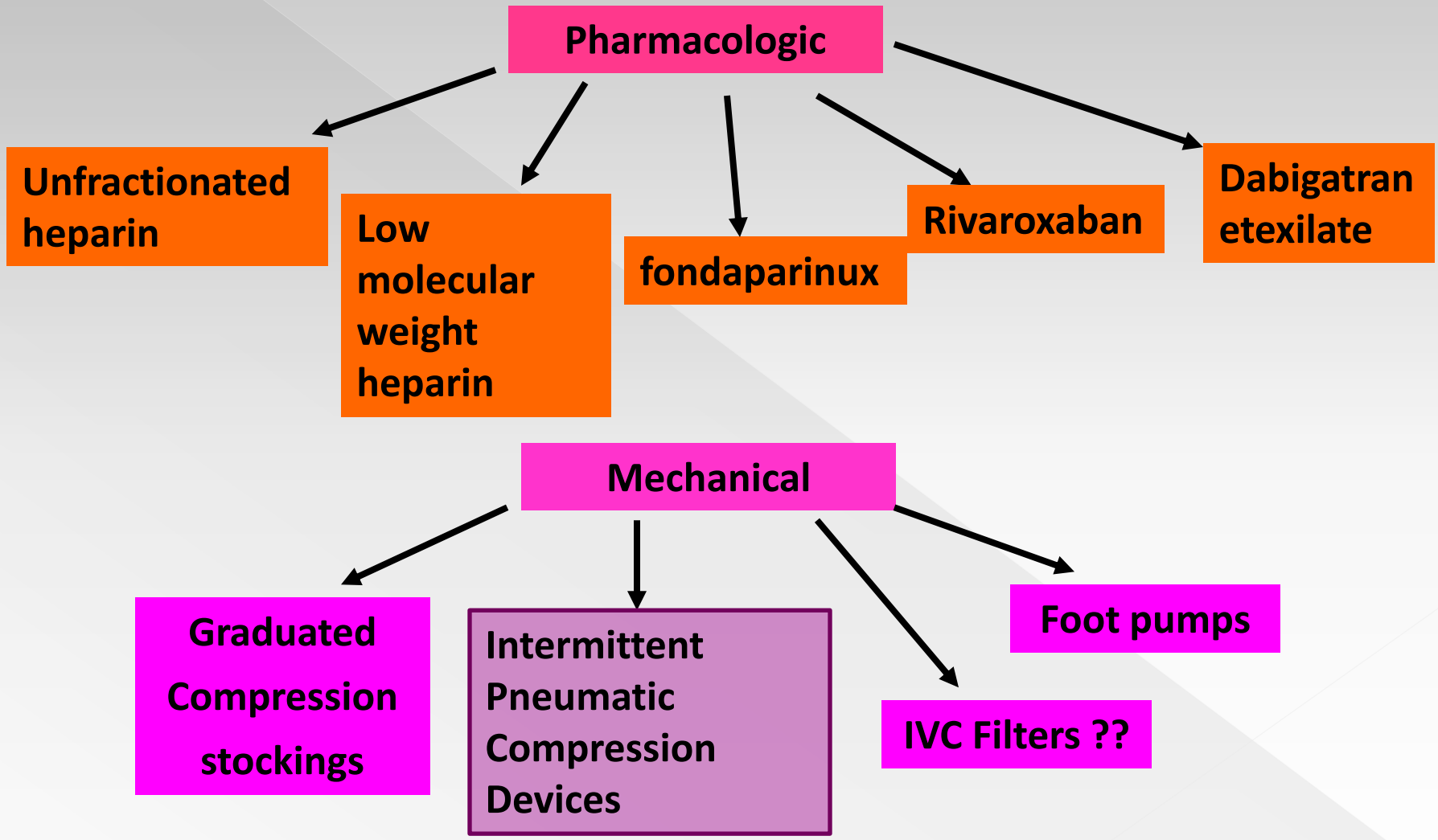
Methods of Prophylaxis



Appropriate use of prophylaxis against deep venous thrombosis(DVT) in hospital inpatients

Important

reducing the risk of fatal and non- fatal
pulmonary embolism
and
post-thrombotic complications

VTE prophylaxis

Guidelines

- National Instituite for Health and Clinical Excellence , **NICE** guideline
- The **Cochrane** collaboration
- Scottish Intercollegiate Guidelines Network, **SIGN** guideline
- The American College of Chest Physician, **ACCP** guideline

- Based on
  - risk of VTE score
  - type of procedure (surgery)
  - risk of bleeding
  - comorbidity (peripheral arterial insufficiency)

Recommendations

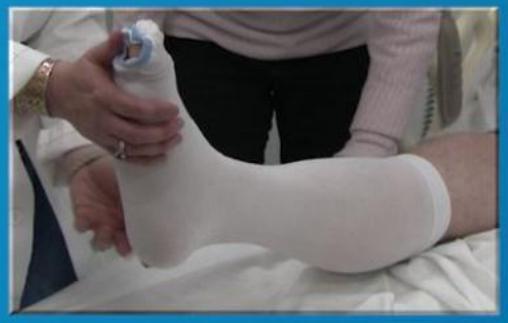
For low risk

- **Ambulation**
- **Mechanical methods**
  - GCS,
  - IPC and
  - foot pumps
- can provide added protection

Higher risk

- guideline based on anticoagulation
  - LMWH,
  - UFH or vitamin K antagonist ,
  - Fondaparinux,
  - dabigatran

Mechanical prophylaxis

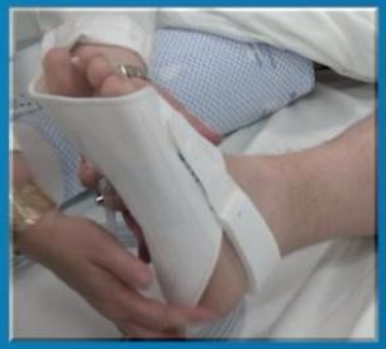


Graduated Compression Stockings

GCS

Intermittent Pneumatic Compression

IPC



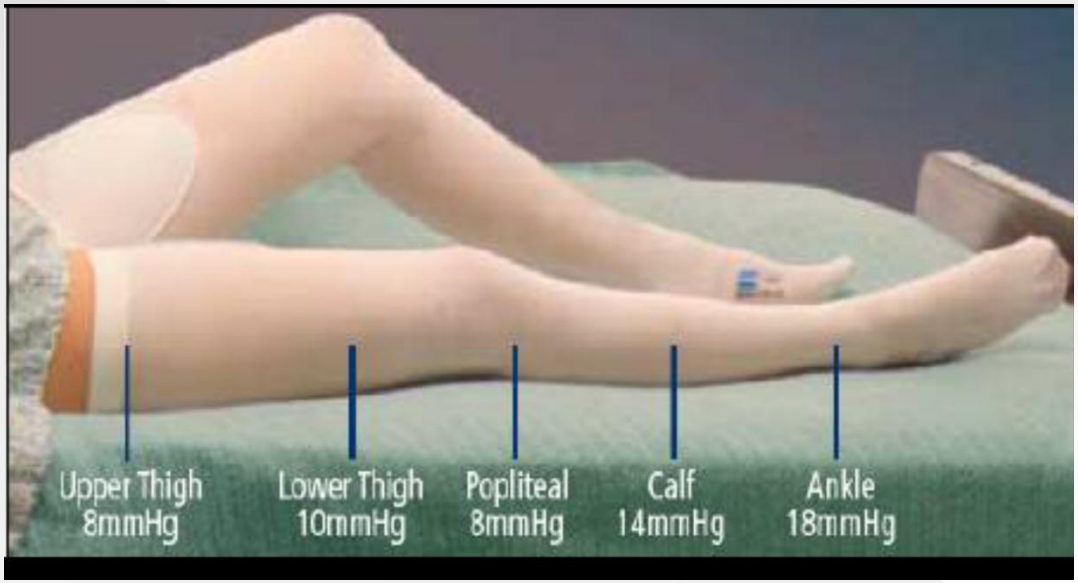
Venous Foot Pump

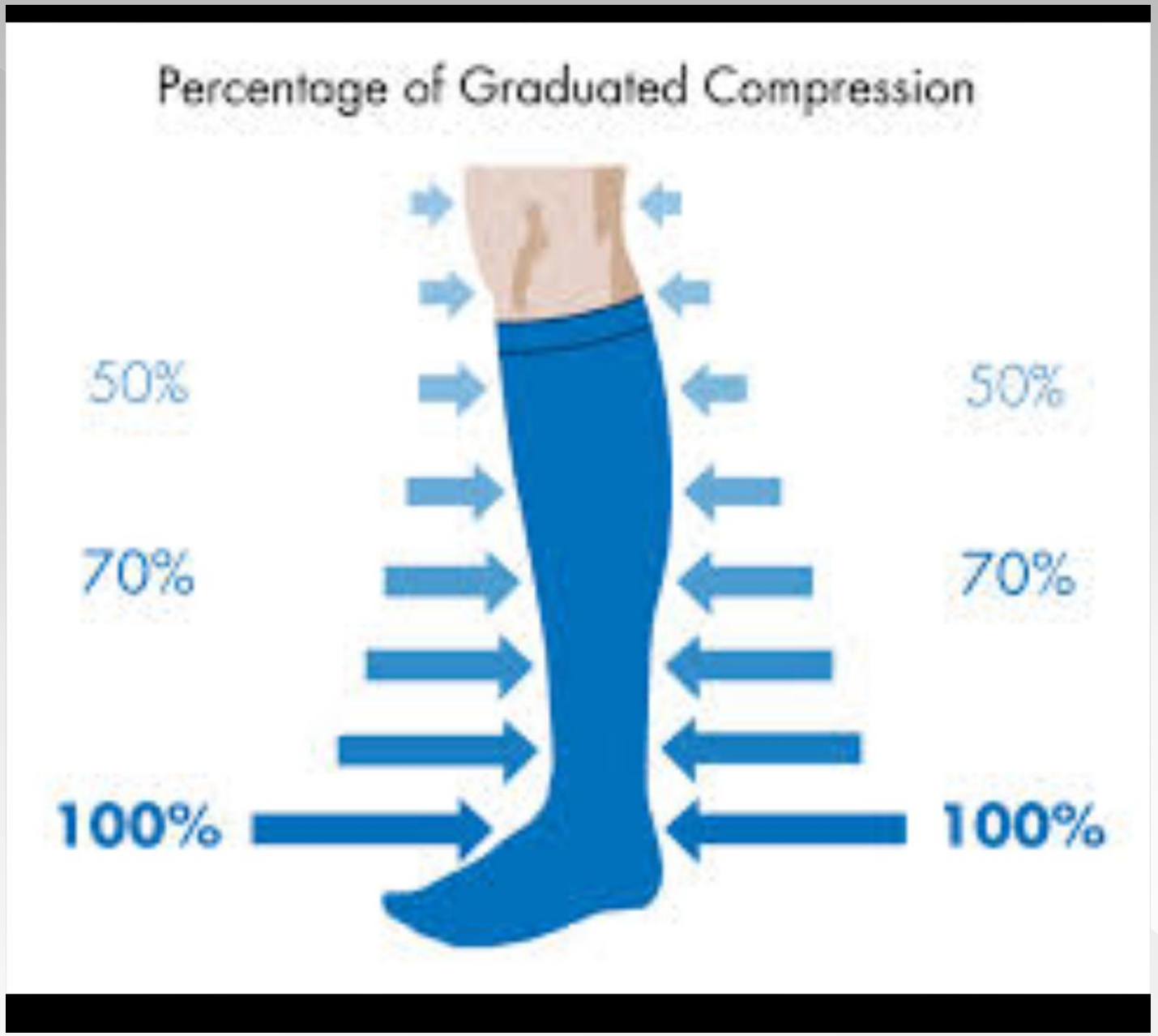
VFP

Graduated Compression stockings

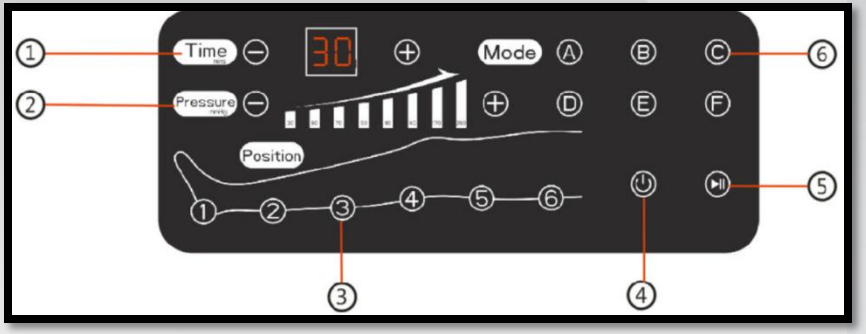
Anti-embolism Stockings Size Chart

Size	circumference			length	
	ankle	calf	thigh	to knee	to thigh
Small	7" - 8 1/4"	11" - 14"	up to 21"	up to 15"	up to 28"
Medium	8 3/8" - 9 5/8"	13 1/2" - 16"	up to 22"	up to 16"	up to 29"
Large	9 3/4" - 11"	15 1/2" - 18"	up to 24"	up to 17"	up to 30"
X-Large	11 1/8" - 12 3/8"	17 1/2" - 20"	up to 26"	up to 18"	up to 32"
2X-Large	12 1/2" - 13 3/4"	19 1/2" - 22"	N/A	up to 18"	N/A
3X-Large	12 1/2" - 13 3/4"	21 1/2" - 24"	N/A	up to 18"	N/A




Percentage of Graduated Compression
50%
50%
70%
70%
100%
100%

Intermittent Pneumatic Compression Devices



Machine and Accessories

device

remote control

User Manual

single hose

double hose

power cord

leg cuff

extension zippper
of width 10cm for legs

waist cuff

arm cuff

Foot pumps

Graduated compression stockings

- Effective in reducing rate of DVT in general medical and surgical patients

- 27 %→13% ,GCS only
- 15%→2% , GCS + background prophylaxis

Amaragiri and Lee,2000; Conchrane database Syst Rev

- 49%→ 26% reduced the post-thrombotic syndrome in patients with DVT

Prandoni et al,2004

Intermittent Pneumatic Compression Devices

- Intermittent pneumatic compression devices for thigh and calf
  - reduced rates of DVT

29% → 11%	IPC alone
15% → 8%	IPC with GCS

Vanek , 1998; Meta-analysis of efftiveness of IPC

- GCS, IPC and foot pumps
  - reduce risk of DVT in surgical patients by two third (monotherapy)

- Reduce the additional 50% with pharmacological prophylaxis
- Mechanical prophylaxis in surgical patients
  - reduce the risk of pulmonary embolism by about two fifth.

Roderick et al ,2005

Mechanical prophylaxis **must be used with caution**

if a patient has **peripheral arterial insufficiency**

Pharmacological prophylaxis

- Patients with one or more risk factors for DVT
  - one of Anticoagulants

- **Heparin- UFH and LMWH**
  - starting at admission,
  - stopping 12hours before surgery and
  - restarting 6-12 hours after surgery

NICE clinical guideline 92 (2010), Vivek , Sep 2017

- LMWH
  - starting 6-12hours after surgery

NICE clinical guideline 92 (2010), Vivek , Sep 2017

- Fondaparinux,
  - starting 6 hours after surgical closure provided haemostasis has been established
  - s/c Fondaparinux 2.5mg once daily

NICE clinical guideline 92 (2010), Vivek , Sep 2017

- Dabigatran etexilate,(Direct thrombin inhibitor)
  - Discontinue 1to 2 days CrCl>50ml/min or 3 to 5 days CrCl<50mi/min
  - starting 1–4 hours after surgery
  - PO Dabigatran 150mg BID

- Rivaroxaban, (Direct factor Xa inhibitor)
  - Stop at least 24hours before procedure
  - starting 6–10 hours after surgery (in elective total hip and knee replacement)
  - PO Rivaroxavan 10mg once daily

NICE clinical guideline 92 (2010), Vivek , Sep 2017

General surgery

- Advise to stop Estrogen containing oral contraceptives or hormone replacement therapy 4 weeks before elective surgery ;
- if stop, advise to alternative methods

- Assess the risk and benefits of stopping pre-existing established antiplatelet therapy 1week before surgery

- ACCP and SIGN guidelines
  - recommend early mobilisation at low risk patients
- UFH or LMWH for patients with risk factors
- Mechanical prophylaxis with LMWH or UFH for multiple risk factors DVT

The NICE guidelines recommend

- all surgical inpatients are offered mechanical prophylaxis, **GCS**, unless contraindicated

- from the time of admission

- Continue until the patient no longer has significantly reduced mobility

Regional anaesthesia

- Considering for individual patients in addition to methods of VTE prophylaxis ,
- lower risk than general anaesthesia

- timing and safety of anticoagulants use
  - to minimise the risk of epidural haematoma (referring to the summary of product characteristics)

Major Gynaecological surgery

- 4 -75% risk of DVT
- 1% of those with DVT – fatal pulmonary embolism

- Guidelines from American College of Obstetricians and Gynecologists
  - recommend GCS intraoperatively until ambulation starts or UFH or LMWH preoperatively and continued until discharge (at Moderate or High risk)

- ACCP and SIGN
  - recommend UFH or LMWH with use of intermittent pneumatic compression devices

    or
  - graduated compression stockings if anticoagulation is contraindicated

- NICE recommends
  - mechanical prophylaxis for all patients with the addition of LMWH
  - for those with one or more risk factors for DVT

Colorectal surgery

- higher risk than general surgery procedures
- Both LMWH and low dose UFH – reduced DVT and PE
- GCS addition with heparin-additional protection

Major Urological procedures

- multiple risk factors for DVT
- UFH or LMWH, GCS or IPC at high risk

- Extend pharmacological VTE prophylaxis to **28 days postoperatively** in major cancer surgery in the abdomen or pelvis

NICE clinical guideline 92 (2010)

Major vascular surgery

- multiple risk factors for DVT
- But these procedures are accompanied by antiplatelet therapy
- Start mechanical prophylaxis at admission

NICE clinical guideline 92 (2010)

- Guidelines recommend UFH (severe renal failure or established renal failure)or LMWH if vascular surgery patients have additional thrombotic risk factors.

- Continue pharmacological VTE prophylaxis (generally 5-7 days)

NICE clinical guideline 92 (2010)

Neurological surgery (Cranial or Spinal)

- Start mechanical prophylaxis at admission and continue until the patient no longer has significantly reduced mobility

- Guidelines recommend UFH (severe renal failure or established renal failure)or LMWH

NICE clinical guideline 92 (2010)

- Continue pharmalogical VTE prophylaxis (generally 5-7 days)

- **Do not offer** pharmalogical VTE prophylaxis to patients with **ruptured cranial or spinal vascular malformation** or **acute traumatic or non-traumatic haemorrhage** until the lesion has been secured or the condition is stable

NICE clinical guideline 92 (2010)

Orthopaedic surgery

ACCP

- LMWH, vitamin K antagonist or fondaparinux-for elective hip or knee arthroplasty
- UFH or same methods for hip fracture
- Dabigatran

- Heparin-start after admission and continue at least 10 days after major orthopaedic surgery
- 4 to 5 weeks after hip replacement or hip fracture surgery

SIGN

- use of aspirin in elective orhtopaedic surgery and hip fracture surgery

NICE

- Mechanical prophylaxis plus either LMWH or fondaparinux for elective orhtopaedic surgery and hip fracture surgery
- Continue for four weeks after hip fracture surgery and hip replacement in patients with risk of DVT

Lower limb plaster casts

- Considering offering pharmacological VTE prophylaxis to patients with lower limb plaster casts after evaluating the risks and benefits based on clinical discussion with patient

- Offer LMWH (or UFH for patients with severe renal impairment or established renal failure) until lower limb plaster cast removal

NICE clinical guideline 92 (2010)

Trauma patients

- High risk
- ACCP , SIGN
  - recommend LMWH for prophylaxis, with mechanical prophylaxis if risk of bleeding precludes using anticoagulants

Laparoscopic surgery

- Society of American Gastrointestinal and Endoscopic Surgeons **(SAGES)**
  - Update in March 2017 (Endorsement of ACCP)
- ACCP Guidelines 2012
  - not specifically directed at laparoscopic surgery patients

- Reduction of VTE risk significant in laparoscopic surgery than open surgery

Laparoscopic cholecystectomy

Routine use of VTE chemoprophylaxis is likely unnecessary

Rondelli et al,2013

- Chemoprophylaxis
  - should be used according to risk stratification

- Laparoscopic colonic surgery with or without cancer
  - reduction in VTE using IPC with Chemoprophylaxis UFH or LMWH

- Duration- 4 weeks (safe and reduce the VTE risk)

Bariatric surgery

- multiple risk factors
- At least moderate risk – UFH,LMWH or IPC
- Despite elevated VTE risk, incidence-low
- Incidence of PE 0.5% and incidence of symptomatic VTE 0.6% with weight-based chemoprophylaxis UFH,LMWH

- No consensus on the standard care for chemoprophylactic agent, dose, timing, or duration

- Dosing – challenging in postsurgical bariatric surgery patient, by weight may result in excessive dose and bleeding.

- agent, dose, timing, or duration – not determined

- Individual patient's specific risk of VTE, other medical comorbidity and type of procedure must be taken into consideration

Vena Cava Filter Placement

- Prophylactic removable inferior vena cava (IVC) filter use – recommended in high risk bairiatric patients
  - with BMI >60,
  - severe pulmonary hypertention or
  - previous VTE

Sapala et al, 2003

- Argument against prophylactic IVC filter placement
  - 322 out of 97,218 patients receiving IVC filter in bariatric surgery
    - increased risk of DVT, length of hospital stay and mortality than non-IVC group

Li et al, 2012

- no benefit for prophylactic IVC filter insertion

- A meta-analysis of prophylactic IVC filters in bariatric surgery
  - an increase in the risk of DVT by 3 fold,
  - increase in mortality is not statistically significant.

Kaw et al,2014

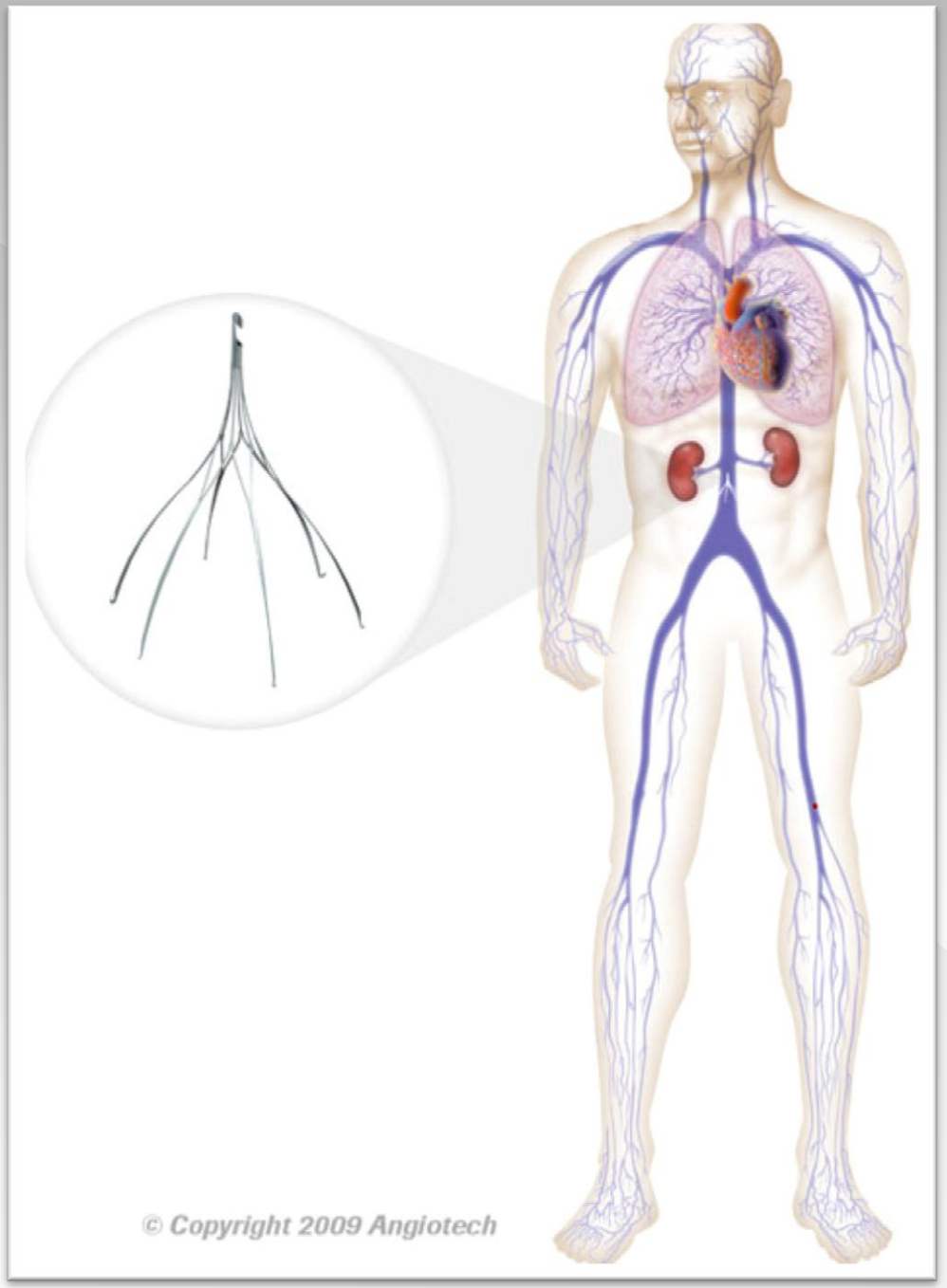
- Long-term complications associated with IVC filters are concerning.

- Most filters are never retrieved

-

- Insufficient data from randomized studies to support the use of prophylactic IVC filters

1. Nicholson et al, 2010
2. Karmy-Jones et al,2007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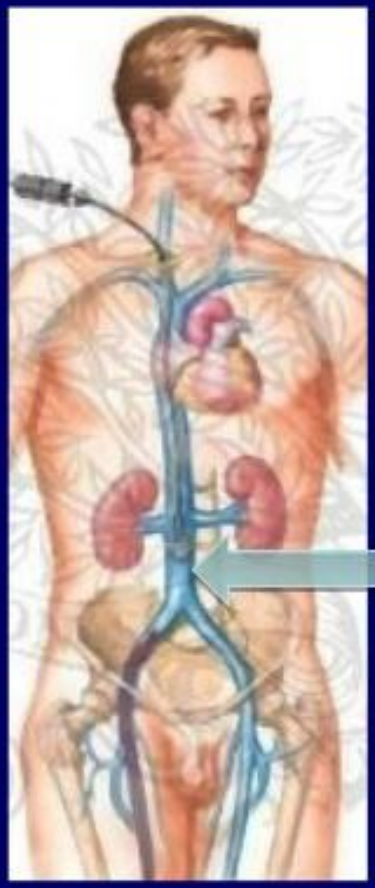
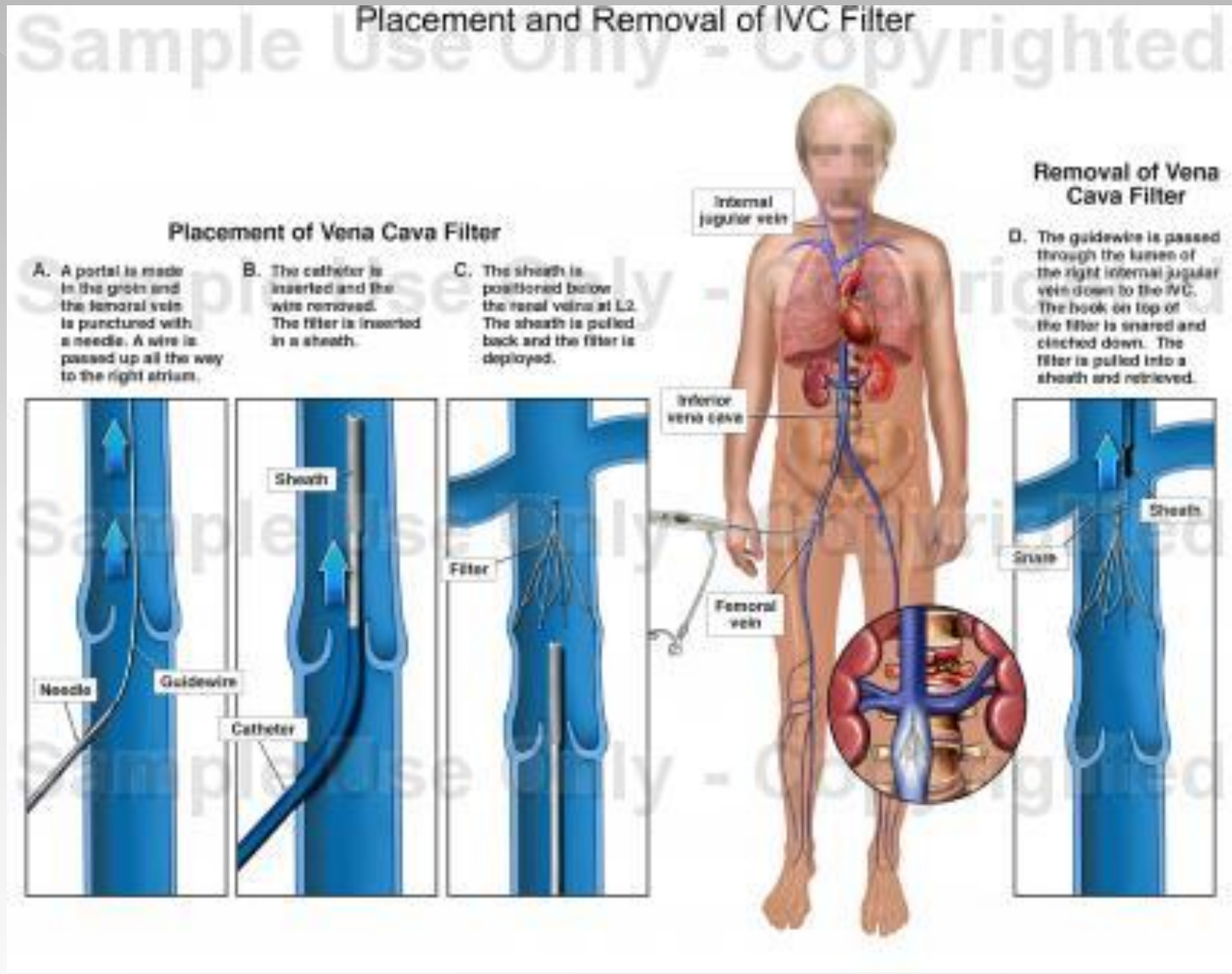
Filter Placement & Location



- Angiographic imaging of the IVC: characterise IVC anatomy, exclude the presence of IVC thrombus.
- Inserted percutaneously via the femoral or jugular approach under fluoroscopy guidance.

INFRARENAL

90% of clinically significant PE originates from the lower extremity or pelvic veins, optimally immediately below the renal veins to minimize dead space if filter becomes thrombosed or IVC thrombus to form.


Placement and Removal of IVC Filter
Placement of Vena Cava Filter
A. A portal is made in the groin and the femoral vein is punctured with a needle. A wire is passed up all the way to the right atrium.
B. The catheter is inserted and the wire removed. The filter is inserted in a sheath.
C. The sheath is positioned below the renal veins at L2. The sheath is pulled back and the filter is deployed.
Needle
Guidewire
Catheter
Sheath
Filter
Internal jugular vein
Inferior vena cava
Femoral vein
Removal of Vena Cava Filter
D. The guidewire is passed through the lumen of the right internal jugular vein down to the IVC. The hook on top of the filter is snared and cinched down. The filter is pulled into a sheath and retrieved.
Snare
Sheath

Conclusion

- Preventable in most cases with simple cost-effective prophylaxis

- DVT prophylaxis
  - reduces the incidence of DVT during the postoperative period by two-thirds,
  - prevents death from pulmonary embolism in 1 patient out of every 200 major operations

- Intermittent pneumatic leg compression
  - reduces the risk of DVT by as much as 59% in general surgery patients
  - It is also virtually free of side effects
  - is as effective as low-dose heparin in patients undergoing abdominal surgery

- Using prophylaxis for DVT is neither complicated nor expensive

- DVT prophylaxis is necessary and beneficial for hospitalized patients to reduce morbidity and mortality and improve outcomes


THANK YOU